Plexus
Computers,
Inc.

P/40 Computer System
Model 1001A/1001B/1001C

PLEXUS

The Plexus P/40 is a 16-bit minicomputer specifically designed for the popular UNIX operating system. The P/40 design combines multiprocessor architecture with a 16-bit job processor, large main memory, intelligent communications processors, and up to 580 Mbytes of high-speed disk storage. This allows the P/40 to achieve high performance while running UNIX. In fact, a typical P/40 configuration gives up to 24 users the performance they expect to find only on the largest minicomputers, but at a cost per user that is competitive with small microcomputer systems.

To back up high performance with high reliability, the P/40 automatically detects and corrects memory and disk drive errors. In addition, the P/40 makes extensive use of LSI circuitry and features an extremely reliable disk drive.

Ease of service, which is key to uptime, has also been designed into the P/40. Mean time to repair is under 30 minutes and requires no special tools.

Industry-standard disk, tape, terminal, and printer interfaces—along with an industry-standard I/O bus—make it easy to attach a wide variety of peripheral devices to the P/40. An industry-standard operating system along with industry-standard programming languages make the P/40 compatible with a wide variety of existing applications software.

The P/40 UNIX system is ideal for the OEM or end user who demands performance, reliability and, above all, the hardware and software flexibility that can only be provided by a computer that utilizes industry standards.

FEATURES
Performance
- [ ] Multiprocessor architecture links powerful job processor with up to eight 16-bit I/O processors
- [ ] High performance 16-bit job processor
- [ ] Up to 4 Mbytes of main memory
- [ ] Modular intelligent communications processors provide up to 24 serial ports and 3 parallel ports
- [ ] Up to 580 Mbytes of high-speed Winchester disk storage
- [ ] Standard 9-track tape provides streaming and normal mode operation

Reliability
- [ ] Error checking and correcting main memory and disk memory
- [ ] Extensive use of LSI circuitry
- [ ] 10,000 hour MTBF disk drive
- [ ] Proven UNIX operating system
- [ ] Easy repair

Standard Hardware
- [ ] Industry-standard peripheral interfaces
- [ ] Multibus (IEEE 796) I/O bus
- [ ] ANSI/IBM compatible tape drive

Standard Software
- [ ] UNIX operating system
- [ ] Standard languages

Designed for the Office
- [ ] Quiet
- [ ] Compact
- [ ] Uses standard AC power

HIGH-PERFORMANCE MULTIPROCESSOR DESIGN

The outstanding performance of the P/40 is made possible by a special multiprocessor architecture. The architecture links a powerful job processor with as many as eight 16-bit I/O processors and allows each I/O processor to use burst multiplexed DMA to transfer data directly to and from main memory. Thus, I/O overhead is removed from the job processor and the P/40 can achieve high throughput while running UNIX.

In a typical P/40 system (e.g., Model 1001A) the job processor and 3 I/O processors are linked together. During operation, the job processor performs computation while the I/O processors handle disk, tape, and serial I/O.

Powerful Job Processor

The 16-bit P/40 job processor features more than 110 distinct instructions that operate on 7 data types, including bits, 32-bit words, and strings. For easy programming the processor has 16 general purpose registers and supports separate instruction and data spaces. It also supports privileged instructions.

In addition, the job processor features a floating-point processor and battery-operated clock/calendar. The floating-point processor performs single-precision (32-bit) or double-precision (64-bit) addition, subtraction, multiplication, and division. It is compatible with the proposed IEEE format.

The battery-operated real-time clock gives the job processor continuous access to the actual date and time of day. The clock is battery powered so that it remains operational even when AC power is removed from the system. The battery, which is automatically recharged when the system is on, lasts up to 60 days between charges.

Large Main Memory

Up to 4 Mbytes of memory can be configured in a P/40 system using 256 Kbyte, 512 Kbyte, or 1 Mbyte modules.

The P/40's large main memory provides ample space for UNIX and allows support of multiple users running large programs.

Modular Communications Processors

In the P/40, all serial I/O tasks are handled by modular Intelligent Communications Processors (ICPs). Each ICP contains a 16-bit processor, 32 Kbytes of RAM (with parity), 16 Kbytes of PROM, 8 full-duplex serial ports, 1 parallel port, and 9 DMA channels. The ICP's powerful processor and large RAM memory allow segments of UNIX or customized communications and terminal handling programs to be downloaded to the ICP and executed locally.

The ICP's 8 serial ports are RS232C compatible and have the modem control lines necessary to support standard asynchronous and synchronous modems. Each port supports asynchronous, bisync, or HDLC protocols at software-selectable rates up to 19.2 Kbaud. All 8 ports can operate at the maximum rate simultaneously since each port has its own DMA channel.

The parallel port that comes with the ICP is designed to support a line printer with a Centronics-type parallel interface. The P/40 can be configured with up to 3 ICPs for a total of 24 serial ports and 3 parallel ports.

Fast, High Capacity Disk Drive

The P/40 disk subsystem supports up to 4 high-performance disk drives. The standard P/40 disk drive provides either 72 or 145 Mbytes of formatted capacity and features a 35 msec average access time, 1 Mbyte data transfer rate, and 10,000 hour mean time between failure (MTBF).

To get the best performance from this fast disk, the P/40 uses an intelligent disk controller that contains a 16-bit processor, 10 Kbytes of memory, and a DMA channel. The controller performs multiple sector transfers that span cylinders, automatic error recovery, and transparent error correction for burst errors up to 11 bits long.

Dual-Mode Tape Drive

The standard P/40 tape drive is a ½-inch, 9-track, 1600 bpi unit that features horizontal mounting, automatic threading, and dual-mode operation.

In streaming mode, which is used for disk backup, the tape drive stores 46 Mbytes of data in 4.8 minutes on a 10½-inch, 2400 ft reel of tape. In conventional mode, the ANSI/IBM compatible drive provides a convenient method for exchanging data with other computer systems.

BUILT-IN RELIABILITY

The two most common causes of downtime in small computer systems are memory errors and disk drive errors. The P/40 automatically detects and corrects these two types of errors.

ECC Memory and Disk

Memory errors are handled by the job processor. Every time main memory is accessed, the job processor provides single-bit error correction and double-bit error detection. Error detection and correction is performed via a 6-bit error code which is appended to each 16-bit word when it is stored in memory.

Disk errors are handled by the disk controller's error checking code logic. During a disk read operation, the disk controller can detect an erroneous data burst up to 32 bits in length and correct an erroneous burst up to 11 bits in length. Error detection and correction is performed via a 32-bit error code which is appended to each sector ID or data field when the field is written to the disk.

LSI Circuitry

Another common cause of downtime in small computers is component failure. To minimize component failures, the P/40 combines conservative circuit design with generous cooling so that component temperatures are kept as low as possible.

In addition, the P/40 makes extensive use of LSI circuitry which is inherently more reliable because it reduces the total number of parts in a circuit.

High MTBF Disk Drive

The most critical peripheral in a high-reliability system is the disk drive. The standard P/40 disk drive features a 10,000 keep hour MTBF. This is nearly twice the MTBF of typical minicomputer disk drives.

Proven Operating System

To back up hardware reliability with software reliability, the P/40 features UNIX, a proven operating system that is fast becoming an industry standard for both large and medium size computers.

Self Test, Easy Repair

P/40 design emphasizes easy service just as strongly as it emphasizes reliability. Every time the P/40 is turned on, each processor automatically performs a complete self-test. Results are displayed on the system console and on circuit board mounted arrays of light-emitting diodes.

The P/40 also features a diagnostic port which allows a terminal or modem to be connected directly to the job processor. The port can be used from a remote location to isolate many hardware and software problems. All P/40 modules are easy to access and replace. Using spare modules, mean time to repair is under 30 minutes and requires no special tools.
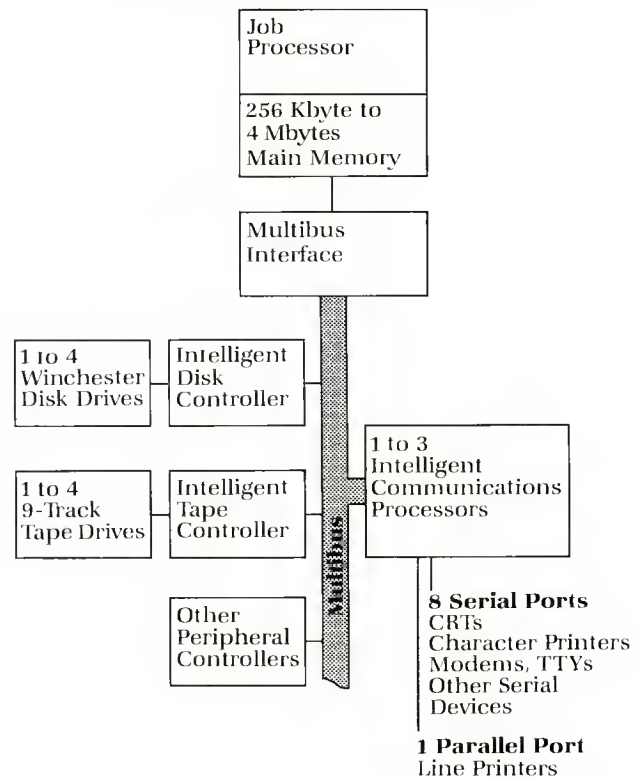
STANDARD HARDWARE FOR EASY INTERFACING

Industry-standard disk, tape, terminal, and printer interfaces, along with an industry-standard I/O bus, make it easy to attach a wide variety of peripheral devices to the P/40.

The P/40 disk interface conforms to the Storage Module disk (SMD) standard. SMD disk drives are available from a number of independent vendors in capacities ranging from 10 Mbytes to 1.2 Gbytes. Thus, a user has enormous flexibility when configuring add-on disk space to the P/40.

Multibus I/O Bus

The P/40 I/O bus conforms to the Multibus (IEEE 796) standard. Multibus products are currently available from more than 50 independent vendors and the number of different products is growing rapidly. Already on the market are Multibus products for communications, data acquisition, bus interconnection, graphics, disk control, tape control, and many other functions. Thus, the Multibus allows P/40 hardware to be easily tailored to a wide variety of applications. To provide a convenient method for exchanging data with other computer systems, the P/40 tape drive features ANSI/IBM compatibility.

Plexus P/40 Computer System Block Diagram

UNIX FOR PORTABILITY, FAST DEVELOPMENT

The UNIX operating system and industry-standard programming languages make the P/40 compatible with a wide variety of existing applications software. This can mean substantial savings in the time and money required to develop and debug applications. In cases where applications must be developed from the bottom up, UNIX with its many utilities offers an excellent environment for program development.

Since the P/40 has standard programming languages, software developed on the P/40 has the advantage of being highly portable.

DESIGNED FOR THE OFFICE

The P/40 is designed to operate in an office environment. It features quiet operation and a compact enclosure. In addition, the P/40 requires no special environmental control or power conditioning.

SPECIFICATIONS

Job Processor

Processor	Z8000
Floating-point	Conforms to proposed IEEE standard
Clock/calendar	Battery-powered; battery is charged when system is on and lasts up to 60 days between charges.
Diagnostics	Diagnostic routines are implemented using 16K of on-board PROM and 2K of on-board RAM.

Memory

Size	Up to 4 Mbytes
Available memory slots	4 (maximum)
Word size	22 bits (2 bytes plus 6-bit error code)
Addressing modes	Byte, word
Cycle time	600 nsec (including error detection and correction)
Error handling	Single-bit error detection and correction, double-bit error detection

Intelligent Communiations Processor (ICP)

Serial ports	8 RS232C interface Full duplex 19.2 Kbaud rate (max.) Modem support on all ports Hardware support for HDLC, async, and bisync protocols
Parallel ports	1 Centronics type interface
Configurability	A P/40 can be configured with up to 3 ICPs for a maximum of 24 serial ports and 3 parallel ports

Disk Subsystem

Formatted capacity	Up to 580 Mbytes using 72 or 145 Mbyte disk drives
Number of drives	Up to 4
Technology	14-inch fixed Winchester
Performance	35 msec average access time, 1.01 Mbyte/sec data transfer rate
Disk MTBF	10,000 hours
Controller interface	Storage Module Disk (SMD)

Tape Subsystem

Tape drive	Automatic threading, ANSI/IBM compatible, 1600 bpi, ½-inch, 9 track
Number of drives	Up to 4
Streaming speed	100 ips
Normal mode speed	25 ips
Rewind speed	200 ips
Reel size	7, 8½ or 10½ inches
Controller interface	Pertec standard

I/O Bus

Bus standard	Multibus (IEEE 796)
Available slots	8 (maximum)

AC Power Requirements

	115 VAC Operation	230 VAC Operation
Line voltage	115 VAC ± 10%	230 VAC ± 10%
Line frequency	60 Hz ± 1%	50 Hz ± 1%
Current (maximum)	7 A	3.5 A

PHYSICAL CHARACTERISTICS

Overall Dimensions

	in.	cm
Width	21.5	54.6
Depth	33.5	85.0
Height	55.0	139.7

Inside Dimensions

Width	Standard 19-inch RETMA rack width
Depth	24 in. (60.96 cm), measured from front mounting surface to rear mounting surface.

Other Characteristics

Weight (max.)	485 lb (220 kg)
Heat dissipation (max.)	3500 Btu/hr (882 Kg-cal/hr)